RESEARCH ARTICLE

Development of an IS change reason–IS change type combinations matrix

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DEVELOPMENT OF AN IS CHANGE REASON-IS CHANGE TYPE COMBINATIONS MATRIX

ABSTRACT

Firms change their information systems (IS) for various reasons, ranging from compliance with government regulations to the development of new capabilities. When making these changes a firm can choose between four different IS change types: IS introduction, IS extension, IS replacement, and IS merger. This paper proposes that change reasons and change types are interrelated, and that certain reason-type combinations are more likely than others to result in a successful IS change. To identify these combinations, an IS change reason–IS change type matrix is developed. While the matrix is created from prior IS research, we conducted a focus group study of IS professionals to further explore and refine the matrix. Findings from the focus group study reveal that some IS change reason–IS change type combinations are more appropriate than others to carry out the IS change project successfully. We also present three examples of IS change projects to illustrate the use and value of the matrix in practice.

Keywords: Information Systems Change, Change Reason, Change Type, Focus Group.

INTRODUCTION

In recent years, the average lifecycle of an information system (IS) continues to shorten (Chen *et al.*, 2003), with estimates ranging between two years (Dix, 2005) and four years (UNECE, 2004). A shorter IS lifecycle suggests that firms initiate frequently IS change projects of which large-scale IS change projects present major challenge for the firm. When changing an IS, firms can choose between four different IS change types: the introduction of a completely new IS (Orlikowski, 1995; Jiang *et al.*, 2000), the extension of an existing IS (Huang *et al.*, 2001; Haines *et al.*, 2006), the replacement of an IS (Taudes *et al.*, 2000; Mukherji *et al.*, 2006), and the merger of two or more IS (Wijnhoven *et al.*, 2006; Robbins & Stylianou, 1999).

Firms change their IS for a variety of reasons, including the development of new capabilities (Helfat & Peteraf, 2003), changes to organisational structures (McKiernan & Merali, 1995), internal power gains (Markus, 1983), and compliance (Haworth & Pietron, 2006). While reasons are triggers for an IS change (Lyytinen & Newman, 2008) they may also influence the choice of the IS change type and the success of the IS change project (Krell *et al.*, 2008). Therefore, managers should consider the change reason when selecting an IS change type and aim for an appropriate IS change type that will increase the likelihood of a more successful IS change. For example, in most cases when an IS change is conducted to achieve regulatory compliance, the change project needs to be completed by a specified date (Garcia, 2004). In this situation, change types associated with low levels of process redesign may be appropriate IS change types because they would allow for a more manageable project and ensure the project meets the time requirements.

To that end, this paper investigates the research question "What are IS change reason-IS change type combinations that are likely to result in a successful IS change?" To answer this question, we conducted an exploratory study in which we developed a matrix of IS change reason-IS change type combinations. The matrix recommends which IS change types could be selected once a particular IS change reason has emerged. Across the different phase of an IS change project, our focus is on the early phase of an IS change project because in this phase the IS change reason

emerges and the IS change type is selected. The success of the IS change project is, however, measured at a later project phase (Markus and Tanis, 2000). Thus, in this research study, we link decisions about IS change types and IS change reasons made during the initial IS change project phase to outcomes (project success) in a later project phase.

The matrix was developed via a two-step approach. In the first step, prior IS research was used to create a matrix of IS change reason–IS change type combinations. We identified three IS change characteristics that allow for differentiating between four IS change types: level of new functionality, degree of process redesign, and level of overall costs. After that, six IS change reasons were identified and combinations with the four IS change types were proposed. In the second step, we explored and refined the matrix through insights from a focus group study with IS professionals.

We also applied the matrix to three IS change projects reported in the literature to illustrate the use and potential value for IS change projects in practice. The matrix is particular useful for IS decision makers during the project's feasibility analysis because it provides guidance in selecting an IS change type that is appropriate for the existing IS change reason (Serafeimidis & Smithson, 2000). The matrix is particularly designed for change of firm-wide used systems (i.e., large-scale IS) (Wheeler, 1994), because for these projects an unsuccessful change poses immense financial risks on firms (Davenport, 1998).

The remainder of the paper is organised as follows. Next, change models, change types, and change reasons are introduced and the literature-based matrix is developed. After that, the focus group study is outlined and results are discussed. Then, the use and value of the matrix is illustrated with three IS change project examples, before limitations and conclusions are presented.

UNDERSTANDING INFORMATION SYSTEMS CHANGE: CHANGE MODELS, CHANGE TYPES AND CHANGE REASONS

Prior research investigated organisational change and distinguishes between continuous and episodic change (Plowman *et al.*, 2007). Continuous change is cumulative and incremental (Meyer *et al.*, 1990) and is often viewed as an endless series of modifications with no beginning and end. In contrast, the episodic perspective sees change as an infrequent revolutionary event with a clearly defined beginning and end (Weick & Quinn, 1999). These changes are often planned activities viewed as distinct interruptions that aim to remove previous organisational conditions (Ford & Ford, 1994).

Drawing on the episodic perspective, a clear distinction among different IS change types and related change reasons is possible. Weick and Quinn (1999) point out that episodic change can be best described through Lewin's (1947) theoretical lens that conceptualises a change as a series of three sequential stages: (1) unfreezing, (2) moving, and (3) freezing. In the first stage, a climate for the IS change is created and the change reason emerges. In the second stage, the change is initiated, planned and conducted. During the third stage, the change is incorporated within the firm. Prior research has demonstrated that successful change projects align more closely with Lewin's three stages than do unsuccessful projects (Grover *et al.*, 1995). From an episodic change perspective, an organisation remains unchanged for a certain period. A change reason then emerges allowing for the determination of the beginning and end of the change (Weick & Quinn, 1999).

Models of Episodic Information Systems Change

We define IS change as the episodically occurring differences within an IS over time. Prior IS research has developed different episodic IS change models that capture the changes to an IS (Kwon & Zmud, 1987; Cooper & Zmud, 1990; Aladwani, 2001; Markus *et al.*, 2000).
Kwon's and Zmud's (1987) model describes IS change as a six-phase process closely aligned with Lewin's conceptualisation. The first phase is identical to Lewin's unfreezing stage and the change reason emerges there. The second and third phases are adoption (the decision to change an IS) and

adaptation (the technical implementation of the change). These two phases form the moving stage in Lewin's conceptualisation. Finally, the three remaining phases in Kwon's and Zmud's model can be mapped to Lewin's freezing stage: the acceptance phase where users become familiar with the IS change, the use phase where the IS change becomes part of the firm's working practices, and the incorporation phase where political and technical issues are resolved (Kwon & Zmud, 1987).

Cooper and Zmud (1999) developed a variation of the Kwon and Zmud's (1987 model by considering post adoption behaviours. Therefore, Cooper's and Zmud's model is also closely aligned with Lewin's unfreezing-moving-freezing conceptualisation. The first two stages are identical to Kwon's and Zmud's (1987) model and differences only emerge in the freezing stage. This last stage comprises the acceptance, routinisation, and infusion phases. In this stage, it is theorised that the changed IS is accepted by the organisational members, used in their daily activities, and increases organisational effectiveness (Cooper & Zmud, 1999).

Aladwani's (2001) episodic IS change model is less closely related with Lewin's model because the three change phases overlap considerable with Lewin's stages. During the first phase, the firm identifies the goals behind an IS change and develops action plans to achieve them. At the beginning of the first phase, the IS change reason emerges. This phase covers the unfreezing stage and also parts of Lewin's moving stage. In the second phase of Aladwani's model, the firm implements the action plans. This phase covers the remainder of the moving stage and the beginning of the freezing stage. Finally, during Aladwani's third phase, the firm evaluates if the goals behind the change have been achieved (Aladwani, 2001). This evaluation phase covers the remainder of the freezing stage.

Markus and Tanis (2000) and Markus *et al*. (2000) describe an episodic IS change model that distinguishes four sequential phases and provides measures of success for the latter three change phases. In the first phase, the change reason becomes apparent and the firm plans the change process. This phase is referred to as the chartering phase, and corresponds to Lewin's unfreezing stage. The subsequent phases are the project phase (the new system is configured and rolled out) and the shakedown phase (the firm integrates the IS in its operational procedures) that form the

moving stage in Lewin's model. The final change stage is the onward phase, during which the firm uses the new IS and captures most of the benefits of the change (Markus & Tanis, 2000). The onward phase corresponds with Lewin's freezing stage. We utilise Markus *et al.*'s model to study the likelihood of particular IS change reason-IS change type combinations resulting in a successful IS change. According to Markus *et al.*, IS change success can be first formally measured at the end of the project phase where it is defined as adherence to budget, time schedule, and functionality and may in turn enable improvements of various performance indicators in later phases (Markus *et al.*, 2000).

Figure 1 illustrates that all the episodic IS research models we presented can be mapped into Lewin's conceptualisation. Figure 1 also highlights that for all models, the IS change reason emerges during the initial phase, and that the success of the IS change project is measured at the end of the project phase.

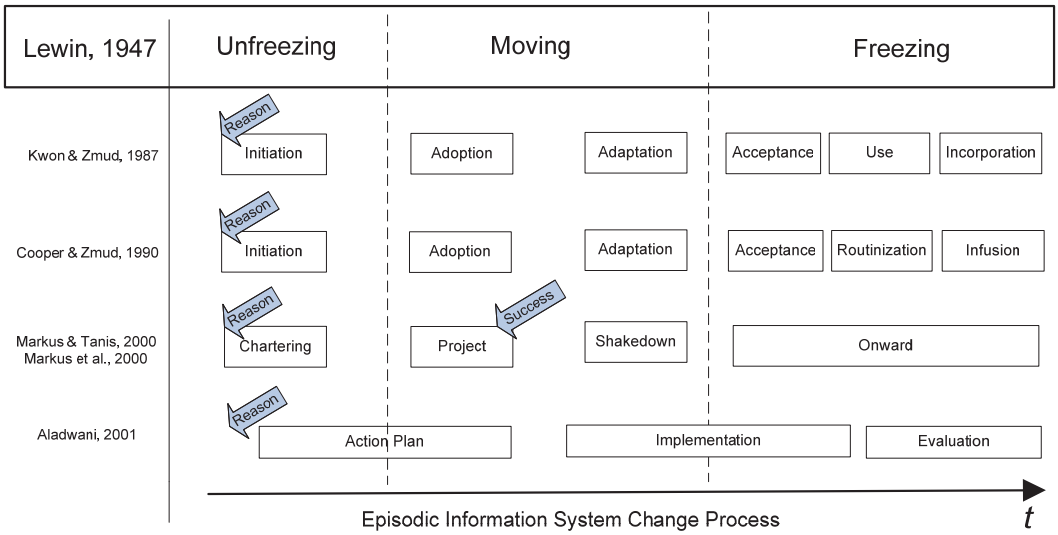

Figure 1 Models of episodic Information Systems Change

Characteristics of Information Systems Change Types

Prior research has shown that different types of IS changes exist. These IS change types differ with respect to three characteristics: (1) the level of new functionality provided (Haines *et al.*, 2006); (2) the degree of process redesign required (Ettlie & Reza, 1992; Changchien & Shen, 2002); and (3) the overall costs of the IS change (Ryan & Harrison, 2000; Keil, 1995).

The first characteristic is the level to which new functionality is provided. This characteristic refers to the creation and availability of IS functions that did not exist previously in the entire firm. As such, the decision as to whether a function is to be considered a new IS function is made from an organisational level, that is, top-management/IT management perspective. While some IS changes provide no new functionality, others provide new functionality aspects (for example, improved quality of IS functionality), or modifications to existing IS functionality that enable the usage of this functionality in a different business process. Examples of this characteristic include the implementation of decision support tools and the installation of process automation technology.

The second characteristic is the degree of process redesign associated with the IS change. This characteristic is defined as the purposeful and systematic modification of the work flows and processes within the firm. It includes any changes to the firm's processes, changes to the way in which IS are applied in these processes, and, if required, user training (Changchien & Shen, 2002). The degree of process redesign is considered high if new IS-facilitated processes are designed, medium if major changes to existing IS-facilitated processes are implemented, and low if minor or no process is changed.

The third characteristic is the overall costs of an IS change. This characteristic is defined as the total amount of expenditures associated with the IS change, including acquisition costs and start-up administration costs to implement and roll-out the IS (David *et al*., 2002). The overall costs result from expenditures, for example, for information technology (IT) infrastructure, user training, and a temporary productivity loss during the IS change (Ryan & Harrison, 2000; Keil, 1995). The overall costs of an IS change can range from low to very high.

In the following paragraphs, we use the three change characteristics to describe the four IS change types (viz., IS introduction, IS replacement, IS extension, and IS merger). Table 1 summarises the descriptions.

In an IS introduction project, a firm implements an IS that offers new major functionality not provided by any current IS in the firm (Boddy & Paton, 2005). We argue that the degree of process redesign is high because it is assumed that various business processes change from manual to IS-

facilitated due to the introduction of the IS (Orlikowski, 1995). The high degree of process redesign has implications for the overall costs because an IS introduction requires a high level of user training (Jiang *et al.*, 2000), additional hardware and software to develop the new IT infrastructure, and may cause high productivity losses as existing processes are temporarily interrupted (Hitt *et al.*, 2002). Thus, IS introduction is associated with very high overall costs (Davidson & Chiasson, 2005).

In an IS replacement project, a firm substitutes an existing IS with a new IS that is similar in functionality but may offer new functionality aspects (Mukherji *et al.*, 2006). An IS replacement requires a medium degree of process redesign because IS-facilitated processes already exist in the firm (Haines *et al.*, 2006) but may need to be adapted. Due to the medium level of process redesign, an IS replacement is associated with fewer process interruptions than an IS introduction, but the process interruptions may affect the firm's ability to create value. Thus, IS replacement is associated with medium level productivity losses (Mukherji *et al.*, 2006). Further, user training costs are low to medium because users are already familiar with a similar system (Palaniswarmy & Frank, 2000), but IT investments are potentially high because a number of IT infrastructure components may need to be replaced (Taudes *et al.*, 2000). Considering the different costs, we argue that IS replacement is associated with high overall costs (Rajagopal, 2002).

In an IS extension project, new hardware and software components are added to an existing IS. The new components provide new functionality aspects (Haines *et al.*, 2006). In contrast to an IS replacement, all prior components of the IS stay in place. Process redesign is restricted to those departments, divisions, and hierarchy levels that use the additional functionality (Huang *et al.*, 2001). Consequently, the degree of process redesign and user training are low when assessed at the firm level (Georgiou *et al.*, 2007). The costs for the additional hardware and software components are low to medium. Thus, productivity losses and training costs are limited, and overall costs of an IS extension are low to medium (Haines *et al.*, 2006).

In an IS merger project, two or more existing IS of similar functionality are merged into one new IS. Examples include the merger of existing accounting IS in the aftermath of a firm merger

(Wijnhoven *et al.*, 2006), or the merger of different IS, which contain medical records, in the aftermath of a hospital merger (Fulop *et al.*, 2002). An IS merger can be conducted using a variety of techniques, ranging from the direct combination of source code or data of two systems (Arellano & Weber, 1998) to the installation of system components that connect both systems, such as middleware, or a common database (Van Den Akker & Siebes, 1997). A merged IS contains components from two or more existing IS and thus, the functionality of the merged IS is very similar to that of the existing IS (Robbins & Stylianou, 1999). The level of productivity losses, the degree of process redesign, and amount of user training vary from low to medium depending on which divisions, departments, and hierarchy levels are affected by the IS merger (Stylianou *et al.*, 1996). The costs of IS mergers also vary. In some cases, the IS to be merged are similar, and as such change costs are comparatively low. In other cases, when the IS to be merged systems differ greatly from each other, costs are very high because of various technical issues (Arellano & Weber, 1998). In summary, overall costs of an IS merger range from low to very high (Sumi & Tsuruoka, 2002).

Table 1 Characteristics of Information Systems Change Types

Characteristic	IS Change Type			
	Introduction	Replacement	Extension	Merger
Level of new functionality	New major functionality	New functionality aspects	New functionality aspects	No new functionality
Degree of process redesign	High	Medium	Low	Low to medium
Level of overall costs	Very high	High	Low to medium	Low to very high

Reasons behind Information Systems Change and their Relations to Change Types

Various definitions of change reasons exist (for example, Liang *et al.*, 2007; Mohr, 1982). Following Mohr, a change reason is defined as the motive that drives a particular action of a firm. Consequently, an IS change reason is the motive that drives an IS change. The management literature provides various examples how reasons affect actions of firms. For example, Kuemmerle

(1999) has shown that reasons affect firms' decisions to invest in R&D activities. Frederikson (1985) observed that reasons behind business strategy changes affect the way in which the changes are conducted.

In IS research, few studies on reasons and their impacts exist. Some studies report the existence of particular reasons behind IS change (Teo *et al.*, 2003; Markus & Tanis, 2000), while others have shown that some reasons affect IS usage after an IS change is completed (Liang *et al.*, 2007).

Prior studies have pointed out that an IS change affects and is affected by various stakeholders because of their interest in the firm and their ability to influence the firm's decisions. The stakeholders are driven by their own goals and interests which are very likely competing (Pouloudi & Whitley, 1997). Thus, when decisions in a firm need to be made, including the change of a large-scale IS, managers should ensure that the reason to change is aligned with the firm's overall strategic direction and long-term objective (Reynolds *et al.*, 2006). Part of this alignment process is also the decision about how to carry out the change (Davenport, 1998).

In the following paragraphs, we study four IS change reasons and discuss which IS change types seem appropriate for each of the four reasons so that the change is likely to be successful. Our IS change reasons were selected because they focus on external and internal motives to change a firm's IS and are relevant to changes of large-scale IS. The reasons fall in the categories of strategic/organisational reasons and political reasons (Baldwin *et al.*, 2001). The IS change reasons are (1) isomorphic pressure: compliance pressure and mimetic behaviour, (2) capability design: capability creation and capability adjustment, (3) organisational structure change, and (4) power.

Isomorphic Pressure and related Change Types

The change reason isomorphic pressure is derived from institutional theory. This theory assumes that a firm's activities are closely interconnected with the firm's environment and changes in the environment put pressure on the firm. The firm complies with the pressure if it considers the pressure legitimate (Meyer & Rowan, 1977). Institutional theory proposes that different firms react to external pressure in similar ways and, hence, become more similar to each other over time.

External pressure is, therefore, referred to as isomorphic pressure. Three types of isomorphic pressure exist in the literature: coercive, normative, and mimetic pressure (DiMaggio & Powell, 1983).

Coercive pressure arises when an institution in a firm's environment (for example, a governmental agency or major customers/suppliers) directly or indirectly requests that the firm undertakes certain activities (DiMaggio & Powell, 1983). In the information age, these activities often require firms to change their IS (Liang *et al.*, 2007). For example, the Sarbanes-Oxley Act (SOX), a set of accounting regulations enacted in 2002 in the US as a consequence of the Enron scandal (Hall & Liedtka, 2007), forced many firms to make changes to their accounting IS (Hu *et al.*, 2007; Garcia, 2004). Normative pressure emerges when a firm has internalised norms defined by industrial bodies and considers the norms in decisions and actions. Thus, managers perceive the norm as a legitimate way to address particular challenges (DiMaggio & Powell, 1983). Nowadays, many industry norms include IS specifications that the firm needs to consider (see for example, Guler *et al.*, 2002).

Coercive pressure and normative pressure are referred to as compliance pressures because the firm changes the IS to achieve compliance with regulations or norms created by external organisations. To achieve compliance, firms need to expand existing IS functionality or implement new functionality (Kim *et al.*, 2007). Hence, only change types that provide new functionality or new functionality aspects may will achieve compliance and a successful IS change. Coercive and normative pressures arise within short periods of time and the associated IS changes cannot be planned in advance (Garcia, 2004). Furthermore, laws and contracts often define dates by which firms need to have achieved compliance (Haworth & Pietron, 2006. For compliance motivated IS changes in which completely new major functionality is to be achieved, firms should choose an IS introduction. For the implementation of some new functionality aspects, a firm has an option to choose between an IS replacement and IS extension. The choice can be based on the degree of process redesign and overall costs. When comparing the two change types in Table 1, an IS extension requires less time to redesign a firm's processes and has lower overall costs than an IS

replacement. Thus, a firm should choose an IS extension over an IS replacement as the likelihood of schedule and budget adherence is greater and as such the likelihood of success of the IS change project is greater as well. Thus, it is proposed:

Proposition 1a: *When a firm changes an IS because of compliance pressure, the most appropriate change types are either IS introduction or IS extension.*

Mimetic pressure occurs when a firm is uncertain how to react to a particular problem and observes how another organisation has successfully solved a similar problem (DiMaggio & Powell, 1983). Due to its own uncertainty, the firm mimics the solution of the other organisation (Burns & Wholey, 1993). The mimicry of an IS is a challenge that firms often fail to master because managers and staff often have only a limited understanding of how the other organisation's IS is designed and utilised. Sufficient information about the design of the IS and its impacts on business processes is a crucial prerequisite for a successful IS change. Institutional theory suggests that this information is gathered through direct or indirect observation of the organisation that is being mimicked (DiMaggio & Powell, 1983). Although direct observations are usually not possible, firms may obtain relevant information about IS changes from IT-related media (for example, practitioner journals, practitioner conferences, and CIO video interviews such as "ZDNet Australia CIO views"). Nevertheless, these sources mainly report information that is available without requiring access to confidential company information. The media may receive the information from the software or hardware vendors because the vendors may benefit from reports about their products being implemented in a firm. Examples of such reports include information on the introduction of new enterprise resource planning (ERP) systems (BusinessWorld Philippines, 2009) and the replacement of one ERP system with another one (SAP News Release, 2008). Hence, we conclude that IS change types about which the IT-related media report are predominantly either IS introduction or IS replacement.

In contrast, information about IS extension and IS merger projects in other firms is difficult to obtain because such information is rarely published. Information presented to the business community is only high level information about what IS changes have occurred but not the detailed information explaining how an IS change has been undertaken and is utilised. This type of detailed

information is needed to carry out an IS extension and an IS merger. Hence, firms lack sufficient details necessary to successfully mimic large-scale IS changes via IS extension and IS merger. Thus, it is proposed:

Proposition 1b: *When a firm changes an IS because of mimetic behaviour, the most appropriate change types are either IS introduction or IS replacement.*

Capability Lifecycle and related Change Types

The change reason capability lifecycle is based on capability lifecycle theory. A capability is defined as the ability of a firm to "perform a set of coordinated tasks, utilising organisational resources, for the purpose of achieving a particular end result" (Helfat & Peteraf, 2003, p. 999). Capability lifecycle theory states that capabilities follow a lifecycle during which they are first constructed and built, and later adjusted to changes in the environment of a firm (Helfat & Peteraf, 2003). In the information age, the majority of capabilities require the use of IS and hence, we understand the capability lifecycle as an IS change reason which embraces two sub-reasons: the creation of a capability and the adjustment of a capability.

The creation of a new capability can be achieved if an IS change enables a firm to perform a new task (Peppard & Ward, 2004; Helfat & Peteraf, 2003). The performance of a new task requires changes in the IS functionality. Consequently, we argue that firms which implement IS changes to build a new capability initiate an IS change that provides either new major functionality or new functionality aspects. As discussed previously, firms that implement completely new major functionality should choose an IS introduction. However, firms that implement new aspects of existing functionality have the option to choose between an IS replacement and an IS extension. The choice between an IS replacement or an IS extension is based on the degree of process redesign and overall costs. In this decision process, we argue that firms may consider the costs and the schedule of the IS change because these criteria are critical to achieve IS change success (Wixom & Watson, 2001). When comparing the two change types, an IS extension requires less

time to redesign certain processes and lower overall costs than an IS replacement. As such, a firm should choose IS extension over IS replacement. Thus, it is proposed:

Proposition 2a: *When a firm changes an IS to create a new capability, the most appropriate change types are either IS introduction or IS extension.*

At a later stage of the capability lifecycle, existing capabilities are adjusted to respond to changes of environmental conditions. The capability is not fundamentally modified; rather, firms make minor changes to adapt the capability to the changed environment (Helfat & Peteraf, 2003). Consequently, the implementation of new major functionality is not necessary; instead the firm may modify existing IS functionality through the implementation of new functionality aspects. Further, a higher degree of process redesign may reduce the firm's ability to perform certain tasks (Vosburg & Kumar, 2001). To ensure the redesign does not impair existing capabilities, a low level of process redesign is desirable. Hence, the chosen IS change type should only include a low level of process redesign. Consequently, we argue that firms which conduct IS changes to adjust a capability should initiate change types that provide new functionality aspects and require a low level of process redesign. Thus, it is proposed:

Proposition 2b: *When a firm changes an IS to adjust an existing capability, the most appropriate change type is IS extension.*

Organisational Structure Change and related Change Types

The change reason organisational structure change is rooted in organisational fit theory. This theory states that firms aim to achieve congruence between their IS and the organisational context in which the IS is applied (Tavakolian, 1989). The organisational context is the business environment of an IS and includes the structures and processes that the IS supports (Liang & Xue, 2004). To maintain congruence when structures are modified, firms may need to change IS to realign their systems with the modified structures (McKiernan & Merali, 1995). The level of process redesign associated with the IS change is thereby critical for success: if a change requires a high level of process redesign, the process changes may interfere with the organisational structure change and

may require additional changes to organisational structures. Therefore, we argue that to achieve budget and schedule adherence, firms should select change types with a low level of process redesign. As discussed previously, the change types IS extension and IS merger have a low level of process redesign, while the change types IS introduction and IS replacement have a medium or high level of process redesign. Thus, it is proposed:

Proposition 3: *When a firm changes an IS because of organisational structure change, the most appropriate change types are either IS extension or IS merger.*

Power and related Change Types

The change reason power is derived from interaction theory. This theory describes a firm as a conglomerate of individuals who constantly struggle to increase their personal span of control (Markus, 1983). All actions of these individuals and all interactions between them are directed by this struggle (Markus, 1983). An individual is a power holder and as such has power in an organisation when, for example, others depend on the power holder, when the ability of the power holder to provide resources and to cope with uncertainty exists, and when the power holder is able to affect a decision making process (Pfeffer, 1978). All of these power determinants are characterised by availability, access, and control over information (Markus & Pfeffer, 1983). Indeed, Pfeffer (1981) has shown that individuals in a firm who have control over information flows gain increased power.

Prior research has demonstrated that "the design and operation of an organisation's IS … will affect the distribution of intra-organisational power" (Bariff & Galbraith, 1978, p.15) due to its function of providing, distributing, and processing information. This quote suggests that an IS change may stabilise or shift the power balance within a firm (Levine & Rossmoore, 1994). The characteristic of enabling a power shift makes an IS a potential tool that could be exploited to support the private goals of an individual. As such, an IS change can be used to increase an individual's span of control (Doolin, 2004). Consequently, power holders with decision authority

have the opportunity to initiate IS changes to increase or defend their span of control (Rao *et al*., 2007).

When an individual engages in IS changes to increase their span of control, the person will undertake substantial efforts to ensure that the change is successful. Although it might be difficult for a third party to determine if an IS change was initiated because of personal motives, in the interests of the firm only, or a combination of both, the change process itself and the choice for a change type may be influenced if power-related reasons are pursued (Franz & Robey, 1984). Individuals motivated to increase their span of control may aim to initiate IS change projects that take less time and cause less disturbance in the daily activities in the firm because they want the IS change to be carried out as quickly as possible without attracting attention from stakeholders. Any attention from the stakeholders, for example, extensive management scrutiny or user involvement to define requirements, might jeopardise the change or lead to unwanted delays. Thus, IS change types with low to medium levels of process redesign enable a timely and less disruptive change.

Similarly, the costs of the IS change is another aspect that could evoke attention. Expensive projects may experience greater scrutiny and require approval from various stakeholders in the firm. Hence, when the change reason is enhancement of an individual's span of control, an IS change with low to medium levels of overall costs would seem to be easier to initiate and carry out. The cost aspect becomes obsolete when the individual has decision authority over substantial resources making the more expensive IS replacements and IS mergers also appropriate change types. Thus, it is proposed:

Proposition 4: *When a firm changes an IS because of power, the most appropriate change types are either IS replacement, IS extension or IS merger.*

The IS change reason–IS change type combination matrix is presented in Table 2.

Table 2 Literature-based IS Change Reason-IS Change Type Combinations Matrix

IS Change Reason		IS Change Type			
		Introduction	Replacement	Extension	Merger
Isomorphic pressure	Compliance pressure	X	-	X	-
	Mimetic behaviour	X	X	-	-
Capability design	Capability creation	X	-	X	-
	Capability adjustment	-	-	X	-
Organisational structure change		-	-	X	X
Power		-	X	X	X

FOCUS GROUP STUDY

This exploratory research work uses a focus group study to explore and further refine the IS change reason-IS change type combinations matrix. Focus group research intends to understand and explore phenomena, and results may lay the ground work for future theory testing research (Krueger & Casey, 2000). Focus group research benefits from the high degree of flexibility and the collective wisdom in group settings (Zikmund, 2003). Focus groups are particularly useful when the research seeks to explore the degree of consensus on a given topic (Morgan & Krueger, 1993).

A full focus group study should have one to four focus group sessions, with each session having six to ten participants attending (Krueger & Casey, 2000). Participants for this focus group study were recruited from different companies and industries with which the researchers already had contacts and from an executive training program run by the researchers' university. The current focus group study utilised 27 IS professionals who were randomly assigned to one of three focus groups.

The IS professionals were a mixture of managerial and non-managerial IS professionals with extensive experience in large-scale IS implementation and operation projects. Demographics and further details about the focus group participants are summarised in Table 3.

Table 3 Demographics of Focus Group Participants

Characteristics	Focus Groups		
	Group 1	Group 2	Group 3
Number of participants	8 people	9 people	10 people
Industry			
Government	3 people	2 people	–
IT	4 people	7 people	4 people
Health Care	–	—	2 people
Retailing	1 person	–	–
Education	–		4 people
Position in the firm			
Number of non-managerial (technical) and	5 people	8 people	6 people
managerial (business) participants	3 people	1 person	4 people
Years of experiences in IT projects			
< 5 years	3 people	3 people	1 person
> 5 years < 12 years	5 people	6 people	5 people
>12 years < 15 years	–	–	5 people
Experience with these IS (selection only)	Tracking Systems, Enterprise Resource Planning Systems, In-House Auditing Systems, Knowledge Management Systems	Enterprise Resource Planning Systems, Customer Relationship Management Systems,	Inventory Systems, In-house Health Care Systems, University Administration Systems

Each focus group session was scheduled for 90 minutes and conducted by the same moderator. The moderator is an experienced member of the research team and was also involved in the preparation of the sessions. The focus group sessions started with an introductory presentation that provided definitions of IS change success, IS change characteristics, IS change reasons and IS change types. The presentation ensured that all participants had clear, consistent and detailed knowledge of the important concepts. Then, participants were asked to share their experiences and opinions about IS change reasons and IS change types in successful IS change projects. To ensure free and open discussions the moderator reminded participants to maintain confidentiality over the content of the sessions.

Finally, participants were asked to complete a matrix that represented the six IS change reasons and the four IS change types. Participants were instructed to base their answers on knowledge and

experience with successful large-scale IS change projects, and to consider the IS change reason that emerged during the chartering phase when selecting an appropriate IS change type.

Finally, a discussion with the participants aimed to gain further insights. Open-ended questions were used to guide the discussion, namely (1) How does a particular change reason impact the firm's decision to change the IS? (2) From a best practice perspective, under what circumstances is a particular IS change reason-IS change type combination more likely to result in a successful IS change? and (3) Why is a particular change type more appropriate than other types? The discussion allowed the participants to hear what IS change reason-IS change type combinations the other participants perceived to be appropriate and, thus, participants elaborated on the rationale of their decisions. The discussion helped the researchers to better understand why participants recommended particular IS change types for certain IS change reasons.

REFINING THE IS CHANGE REASON-IS CHANGE TYPE COMBINATIONS MATRIX

This section presents the results from the focus group study and discusses the implications of these results for IS change projects.

Focus Group Study Results

The focus group study aimed at further exploring and refining the IS change reason-IS change type combinations matrix. The IS professionals had experienced the literature-based change reasons and change types in their daily work and agreed that certain change reasons were associated with particular IS change types. They further pointed out that the selection of inappropriate change types decreased the likelihood of IS change success.

The refinement of the matrix was carried out in two steps. First, we determined for each cell the percentage of participants who recommended that a particular change type may be appropriate for the change reason. A change type was considered to be appropriate when the majority (50%) of the participants recommended a particular IS change reason-IS change type combination as likely to result in a successful IS change. Second, we examined for each change reason the differences in the percentages between the related change types. We found only one instance where a small

difference (less than 10%) occurred. The difference between the reason-type combination of "Mimetic behaviour-IS extension" (48%) and the reason-type combination of "Mimetic behaviour-IS replacement" (56%) was only 8%. Furthermore, the reason-type combination of "Mimetic behaviour-IS extension" is in close proximity (48%) to the initial majority agreement (50%). As such, we decided to include IS extension as an appropriate change type for mimetic behaviour.

Overall, the IS professionals agreed with most cells in the literature-based matrix. Some minor amendments were made to the matrix based on the focus group study. The analysis resulted in the identification of nine possible IS change reason–IS change type combinations that are likely to result in a successful IS change (see Table 4). An IS introduction is seen as an appropriate change type for the two change reasons of compliance pressure and capability creation. IS replacement is considered an appropriate change type for only the change reason mimetic behaviour. IS extension can be seen as the change type, which for most IS change reasons, is likely to lead to a successful IS change (see Table 4). IS merger is only seen as an appropriate IS change type for the change reason power.

Table 4 Results of the Focus Group Study with IS Professionals

		IS Change Type			
IS Change Reason		Introduction	Replacement	Extension	Merger
Isomorphic pressure	Compliance pressure	63%	44%	78%	19%
	Mimetic behaviour	37%*	56%	48%	7%
Capability design	Capability creation	59%	30%	56%	0%
	Capability adjustment	15%	41%	78%	7%
Organisational structure change		30%	44%	59%	27%*
Power		41%	33%*	41%*	59%

N = 27 (Grey cells indicate IS change reason-IS change type combinations with agreement values >48%)

* *Indicates a cell that was marked with a cross in the theoretical matrix (Figure 2) but has an agreement value <48% in the empirical analysis*

Implications of the Focus Group Study

After an IS change reason emerges and a firm decides to conduct a change of a large-scale IS a change type needs to be selected that is appropriate and allows the IS change to be carried out successfully.

The IS professionals in the focus group study recommended that IS introduction is appropriate for the change reason compliance pressure but not when the change reason is mimicry. The IS professional recommended that the appropriate change type for mimicry is IS replacement or IS extension. Such a recommendation may be explained by the high level of uncertainty associated with mimetic pressure. When mimicking firms, managers might not be completely sure how the IS change will affect their firm. They are also uncertain if the change will bring the desired result (DiMaggio & Powell, 1983). The introduction of a completely new IS in this situation may be risky. Selecting IS replacement over IS introduction reduces the risk because IS replacement is associated with lower costs and a lower degree of process redesign. Hence, if the change turns out to be undesirable and has to be cancelled, the financial losses are lower for an IS replacement.

When considering mimicry as an IS change reason, managers are often confronted with the need to manage change of large-scale IS in conjunction with the modification or adaptation to the IS on a daily basis. The IS professionals in the focus groups expressed that these different changes also add to people's uncertainty about how stable structures and processes are. The change type of IS extension seems to mediate the risks and uncertainties.

We had proposed that an IS merger is an appropriate change type for an organisational structure change and to increase a person's span of control (power reason), but the IS professionals recommended this change type only for the power reason. The focus group results indicate that when the change reason is organisational structure change, professionals prefer IS extension projects because these projects are seen as less complex and thus, more manageable and easier to carry out than IS mergers. An IS merger differs from the other IS change types in that two of its three change characteristics are volatile. The degree of process redesign ranges from low to

medium and costs range from low to very high. Consequently, it seems that for an IS merger the schedule and budget are more difficult to define. Therefore, IS professionals often prefer to select other change types if they have a choice (Fulop *et al.*, 2002). Our results might reflect such concerns of the IS professionals.

When an IS change project has been initiated to facilitate an individual's private interests (Franz & Robey, 1984), the person is keen to ensure the project will be carried out successfully in a timely fashion, with minimal disruptions, and without drawing scrutiny to the project. Because these aspects are applicable to an IS replacement and IS extension, the IS professionals concluded these two change types were not appropriate when the change reason is power. The IS professionals suggested instead that an IS merger may be chosen because the initiator can leverage the fact that no new functionality is created. The practitioners suggested that in this case a successful strategy would be to promote the IS change as a project that combines two existing systems, thereby offering no new functionality and causing minimal disturbances to the daily business activities. By pointing out to the various stakeholders that the new IS will not offer any new functionality, no user involvement for defining requirements and no extensive management approval is required. In addition, an IS merger is also an attractive change type for power enhancement reasons because it provides an increased ability to control access to information due to the combination of previously dispersed data (Markus 1983).

The IS change reason–IS change type combinations matrix was developed for IS change projects in firms where the focus is on only one IS change project. The IS professionals discussed, however, that a firm often makes more than one IS change at the same time. Due to a firm's often limited and competing resources, firms select an IS change type with fewer impacts on the firm, that is, IS extension, to increase the likelihood of success. The change characteristics of IS extension explain why this change type seems to be appropriate for most IS change reasons. The low costs and low process redesign requirements of this change type increase the likelihood of schedule and budget adherence. To meet deadlines and to stay within budget is particular important in situations when IS changes need to be completed in a short time or with a small budget. Such situations often

happen in industry, especially in times of economic downturns, when firms attempt to cut IT expenditures.

ILLUSTRATION OF THE USE AND VALUE OF THE IS CHANGE REASON–IS CHANGE TYPE COMBINATIONS MATRIX

To illustrate how the IS change reason-IS change type combinations matrix may be applied in practice, we use three examples of IS changes that were documented in various published sources (Newswire, 2007a/ 2007b; BusinessWire, *2005;* Teresko, 2004; Jesitus, 1997; MacDonald, 1998; Davenport, 1998). Table 5 presents a comprehensive overview of three IS change projects conducted in firms.

Table 5 Overview of Three IS Change Project Examples

Characteristic	Polaris International	Texas Instruments	FoxMeyer
Industry	Accounting, Consulting	Technology, Semiconductor	Pharmaceutical
IS change reason	*Coercive Pressure*: Compliance with SOX, Sections 404 and 302	*Capability Adjustment*: Acceleration of error detection in the production process of semiconductor wafers	*Capability Adjustment*: Improvement of order procedures, acceleration of shipping times
IS change type	*IS Introduction:* A compliance business intelligence tool (Aline4SOX) was implemented for the first time	*IS Extension:* An Oracle Database was extended by a data analysis tool	*IS Replacement:* A legacy ERP system was replaced by an SAP system
Key features of the IS change	• Pressure to implement new IS functionality within an externally defined due date • Process redesign required to establish internal controls	• Initial attempt to combine all existing databases into one master database • Attempt was given up during early stages of planning due to concerns that error detection processes would be interrupted • IS extension enabled the firm to continue existing error detection processes during the IS change	• Severe disturbance to distribution processes occurred due to process redesign activities • These disturbances resulted in high change costs
Outcomes of the IS change	• The IS was successfully implemented • SOX compliance was achieved	• The IS was successfully implemented • Error detection processes were accelerated	• The IS was implemented with errors (technical & process redesign ones) • Improvement/ acceleration of processes was tried but was not achieved
References	Newswire, 2007a/ 2007b	Teresko, 2004; BusinessWire, 2005	Jesitus, 1997; Davenport, 1998; MacDonald, 1998

The first example is Polaris International, an international affiliation of 200 accounting and consulting firms in 90 countries. In 2007, the members of Polaris International decided to introduce the Aline4SOX business intelligence IS to ensure SOX compliance. The system was introduced to plan, build, test, and manage new managerial controls over financial transactions that were required in SOX. The reason behind the IS change in this case was compliance pressure, and the change type chosen was IS introduction.

The IS change reason-IS change type combinations matrix (see Table 4) recommends that IS introduction is an appropriate change type for this change reason because an IS introduction provides new functionality required for compliance with coercive pressures. Through the introduction of the Aline4SOX IS, Polaris International could build IS functionality that was necessary to establish the new managerial controls required to achieve SOX compliance. The IS introduction was completed successfully and subsequently, the firm became SOX compliant (Newswire, 2007a/ 2007b). The example of Polaris International illustrates that when the IS change reason is coercive pressure, then an IS introduction is an appropriate IS change type.

The second example is Texas Instruments a technology firm based in Dallas, Texas (US). One of the firm's core competencies is the production of semiconductor wafers. Timely error detection is critical for the firm. At Texas Instruments, error detection was often delayed because it required the consolidation of data from different Oracle databases. In 2004, the firm planned to accelerate the error detection process and integrate the data from the different databases. Initially, discussions focused on integrating all data into a single data warehouse (Teresko, 2004). Senior engineers feared, however, that the implementation of the data warehouse would require a redesign of the error detection process that would temporarily interrupt error detection. Thus, the idea of a single data warehouse was abandoned. Instead, the firm decided to extend existing databases through a new data analysis tool that allowed real-time cross-database data consolidation and analysis. The IS change reason in this case was capability adjustment (BusinessWire, 2005).

The originally planned implementation of a data warehouse would have been IS introduction. The IS change reason-IS change type combinations matrix recommends that an IS introduction is not an

appropriate IS change type for the IS change reasons of capability adjustment as it might interrupt existing processes (see Table 4). Indeed, the Texas Instruments case illustrates that the IS introduction project was abandoned because of concerns that the change might severely interrupt the error detection processes. The implementation of the additional database tool is an IS extension when evaluated from a top-management/IT management perspective. According to the IS change reason-IS change type combinations matrix, IS extension is a more appropriate IS change type because it requires a lower level of process redesign. Therefore, an IS extension is less disruptive and allows for continuance of existing processes. The IS extension project was completed successfully at Texas Instruments without major interruptions of the error detection in the semiconductor wafer production. The new database tool enabled engineers at Texas Instruments to detect errors in a shorter time than before (Teresko, 2004; BusinessWire, 2005). The example of Texas Instruments illustrates that when the change reason is capability adjustment, an IS extension is an appropriate change type.

Our third example is FoxMeyer, the fourth largest pharmaceutical supplier in the US in the early 1990s. In 1993, FoxMeyer began to replace a legacy order management IS with an ERP system in an attempt to improve order management procedures and accelerate shipping times (MacDonald, 1998). During the IS change, FoxMeyer struggled with exploding implementation costs and severe disturbances to its distribution processes as a consequence of the process redesign associated with the ERP implementation (Jesitus, 1997). The IS change reason-IS change type combinations matrix offers an explanation for the unsuccessful IS change. The change reason was capability adjustment because FoxMeyer attempted to modify its ability to ship pharmaceutical goods to hospitals. The change type was IS replacement. The IS change reason-IS change type combinations matrix illustrates that an IS replacement is not an appropriate IS change type for the change reason of capability adjustment because the high level of process redesign associated with an IS replacement can cause disturbances to existing business processes. Thus, the adjusted capability may be negatively affected by the IS change (see Table 4). Indeed, in FoxMeyer's case, the IS replacement project required a high degree of process redesign, and consultants hired by FoxMeyer struggled to

align the company's complex distribution processes with the ERP system. The misalignment between the distribution processes and the ERP system had a critical impact on FoxMeyer's delivery processes and resulted in high costs for the firm. As a result, FoxMeyer could not correctly process a large number of orders during the IS change that led to a considerable decrease in turnover and finally bankruptcy. The example of FoxMeyer illustrates that an IS replacement may not have been an appropriate IS change type when the change reason was capability adjustment.

CONCLUSIONS

The objective of this study was to develop a matrix of IS change reason-IS change type combinations that are likely to result in a successful IS change. The matrix was initially developed from prior literature and further explored and refined in a focus group study with IS professionals. Finally, the matrix was applied to three examples to illustrate its use and value for practice. The final matrix provides recommendations about IS change types that could be selected once a particular IS change reason has emerged. These recommendations can be used to support decisions during the feasibility analysis of an IS change project.

Among the four IS change types, viz. IS introduction, IS replacement, IS extension, IS merger, the most commonly recommended change type is an IS extension. This change type is appropriate for five reasons that motivate a firm to change their IS. An IS replacement should, however, only be chosen if the change reason is mimetic behaviour. A new IS can be introduced if the reasons are compliance pressure or capability creation. An IS merger is only appropriate for the reason of power.

A number of limitations of this study should be pointed out. First, there are limitations in regards of sampling and data collection. The research is an exploratory study that used focus groups to gain a deeper understanding of IS change reasons and IS change types. Participants have been selected based on their domain knowledge of organisational IS change and thus, may not be a representative sample of a larger population. In addition, the limited number of participants restricts the generalisibility of our findings. The data collection process may have been influenced by the researchers' background, the dominance of a single participant, and the moderation style adopted during the focus group sessions. Therefore, an experienced researcher prepared and carried out the

three focus group sessions (Zikmund, 2003). A second limitation is the subjectivity and relativity of the characteristic values. We believe, however, that the use of values such as low, medium, and high enabled us to cover a broader range of large-scale IS changes. One might also perceive the focus on only six change reasons as a limitation; however, this matrix can be extended to cover a wider range of change reasons.

Change reasons are a crucial factor when making important business decisions, including the choice of an IS change type. Decisions made in the chartering phase, such as the selection of an IS change type, may have an influence on the success of an IS change project. Our research is an initial attempt to investigate a wider range of different reasons and provide a more comprehensive overview of reasons than the limited selection of known reasons. A large variety of change reasons exist in combination with certain IS change types and these may impact on the success of an IS change.

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